Claims

1. Process for the contacting of a wire conductor (113) in the course of the manufacture of a transponder unit arranged on a substrate (111) and comprising a wire coil (112) and a chip unit (115), wherein in a first phase the wire conductor (113) is guided away via the terminal area (118, 119) or a region accepting the terminal area and is fixed on the substrate (111) relative to the terminal area (118, 119) or the region assigned to the terminal area, and in a second phase the connection of the wire conductor (113) to the terminal area (118, 119) is effected by means of a connecting instrument (125, 137).

2. Process according to Claim 1, characterised in that for the purpose of connecting the wire conductor to the terminal area use is made of an ultrasonic instrument.

3. Process according to Claim 1, characterised in that both for the purpose of connecting the wire conductor to the terminal area and for the purpose of arranging the wire coil on the substrate use is made of an ultrasonic instrument.

4. Process according to Claim 1 or 3, characterised in that the arrangement of the wire coil on the substrate of the wire conductor is effected by means of a wiring device taking the form of an ultrasonic instrument in such a way that the wire conductor (20) is subjected to the action of ultrasound in a direction transverse to the wiring plane (28) and the transverse movement

(24) of the wiring device (22) generated by the ultrasonic loading is superimposed on the wiring movement (29) extending in the wiring plane (28).

5. Process according to one or more of the preceding claims,
characterised in that
the transverse movement (24) takes place along a transverse-movement axis that is variable as regards its angle in relation to the axis of the wiring movement (29).

6. Process according to one or more of the preceding claims,
characterised in that
the ultrasonic frequency and/or the angle between the axis of the wiring movement (29) and the transverse-movement axis (24) is varied as a function of the desired depth of penetration of the wire conductor (20).

7. Application of the process for the arrangement of a transponder unit comprising a coil and a chip unit on a substrate according to one or more of the preceding claims,
characterised in that
a final coil region (44) and an initial coil region (43) of a coil (41) which is formed on the substrate (21) by the wiring are guided away via a substrate recess (45).

8. Process according to Claim 7,
characterised in that
the ultrasonic loading of the wire conductor (20) is interrupted in the region of the substrate recess (45).

9. Process according to one or more of the preceding claims,
characterised in that
for the purpose of crossing a wire section that has already been wired the ultrasonic loading of the wire conductor (20) is interrupted in the crossing region (57) and the wire conductor (20) is guided in a crossing plane that is spaced in relation to the wiring plane (28).

10. Application of the process according to one or more of Claims 1 to 9 for the manufacture of a card module (64) having a substrate (55), a coil (50) wired on the substrate and a chip unit (58) connected to the coil (50), whereby in a wiring phase a coil (50) having an initial coil region (51) and a final coil region (52) is formed on the substrate (55) by means of the wiring device (22) and in a subsequent connection phase a connection is implemented between the initial coil region (51) and the final coil region (52) to terminal areas (59) of the chip unit (58) by means of a connecting device (60).

11. Process according to Claim 10,
characterised in that
the substrate consists of a fleece-type material, in particular paper or cardboard, and the connection which is made in the course of the wiring is effected by means of a layer of adhesive disposed between the wire conductor (20) and the surface of the substrate.

12. Process according to Claim 10 or 11,
characterised in that
the connection of the initial coil region (51) and of the final coil region (52) to the terminal areas (59) of the chip unit (58) is effected by means of a thermocompression process.

13. Process according to one of Claims 10 to 12, characterised in that
the manufacture of a plurality of card modules (64) takes place simultaneously in such a way that in a supply phase a plurality of substrates (55) combined to form a yield (70) are supplied to a production device (72) comprising a plurality of wiring devices (22) and connecting devices (60), subsequently in the wiring phase a plurality of coils (50) are formed simultaneously on substrates (55) arranged in a row, then in the connection phase a plurality of chip units (58) are connected via their terminal areas (59) to the coils (55), and
finally in a separation phase a separation of the card modules (64) from the composite yield takes place.

14. Application of the process according to one or more of Claims 1 to 9 for the manufacture of a rotationally symmetrical formed coil, characterised in that
the wire conductor (20) is wired on a substrate taking the form of a winding support (80) and rotating relative to the wiring device (22).

15. Process according to Claim 14, characterised by
the manufacture of a moving coil of a loudspeaker unit which is integrally connected to a vibrating diaphragm.

16. Application of the process according to one of Claims 1 to 9, characterised in that
a number of wiring devices (22) corresponding to the number of cable conductors desired are arranged transverse to the longitudinal axis of a ribbon-shaped substrate (86) and a relative movement between the

substrate (86) and the wiring devices (22) takes place in the direction of the longitudinal axis of the substrate (86).

17. Process according to one or more of the preceding claims,
characterised in that
prior to the connection of the wire conductor (113) to the terminal area (118, 119) a preparatory treatment of the aluminium surface of the terminal area (118, 119) takes place.

18. Process according to Claim 17,
characterised in that
with a view to preparatory treatment a mechanical elimination of an oxide layer disposed on the aluminium surface is effected by subjecting the terminal area (118, 119) to the action of the ultrasonic instrument (125).

19. Process according to Claim 17,
characterised in that
with a view to preparatory treatment the aluminium surface is subjected to a cleansing process.

20. Process according to Claim 19,
characterised in that
by way of cleansing process a dry-etching process, a wet-etching process or a laser treatment of the aluminium surface is employed.

21. Process according to Claim 17,
characterised in that
with a view to preparatory treatment the aluminium surface is provided with a multilayered contact metallisation (138, 139) having a zincate layer which is applied by way of intermediate layer (140) onto the

aluminium face and having an interconnect layer (141, 142) which is provided for the contacting with the wire conductor (113).

22. Process according to Claim 21, characterised in that the interconnect layer takes the form of a layer comprising nickel or palladium.

23. Process according to one or more of the preceding claims, characterised in that the vibrational loading of the wire conductor (113) brought about by ultrasound takes place in a plane substantially parallel to the terminal area (118, 119) and transverse to the longitudinal axis of the wire conductor (113).

24. Process according to Claim 23, characterised in that the vibrational loading of the wire conductor (113) brought about by ultrasound serves for regional removal of a wire-conductor insulation.

25. Process according to one or more of the preceding claims, characterised in that the fixation of the wire conductor (113) is effected on a plastic support sheet which together with the wire conductor (113) and the chip (115) forms a card inlet (110) for the manufacture of a chip card.

26. Process according to Claim 25, characterised in that the fixation of the wire conductor (113) on the plastic support sheet and the connection of the wire conductor to the terminal areas of the chip (115)

serves to form a mechanical suspension of the chip on the plastic support sheet.

27. Process according to one or more of the preceding claims,
characterised in that
the fixation of the wire conductor (113) is effected by wiring with a wiring device comprising an ultrasonic instrument.

28. Process according to Claim 25,
characterised in that
the ultrasonic instrument (121) for the wiring of the wire conductor (113) on the support sheet brings about a vibrational loading of the wire conductor (113) transverse to the longitudinal axis of the wire conductor (113) and transverse to the surface of the support sheet, and the ultrasonic instrument (125) for the connection of the wire conductor (113) to the terminal area (118, 119) brings about a vibrational loading of the wire conductor (113) in a plane substantially parallel to the support sheet and transverse to the longitudinal axis of the wire conductor (113).

29. Device for implementing the process according to one or more of Claims 1 to 28, comprising a wire guide (23) and an ultrasonic generator (34), the ultrasonic generator (34) being connected to the wire guide (23) in such a way that the wire guide (23) is stimulated to execute ultrasonic vibrations in the direction of the longitudinal axis.

30. Device according to Claim 29,
characterised by
a vibrating punch (127) partially encompassing the cross-section of the wire of the wire conductor (113)

and by an ultrasonic oscillator which brings about a vibrational loading of the vibrating punch (127) transverse to the longitudinal axis of the wire conductor (113) which is guided in a profiled end (126) of the vibrating punch (127).

31. Device according to Claim 30, characterised in that the ultrasonic instrument (125) is coupled to a wiring instrument.

32. Device according to Claim 30 or 31, characterised in that the ultrasonic oscillator of the ultrasonic instrument (125) serves simultaneously for ultrasonic loading of the wiring instrument.

33. Device according to Claim 32, characterised in that the ultrasonic oscillator is arranged in such a way that the axis of its effective direction is variable.

34. Device for the wiring of a wire-shaped conductor on a substrate in accordance with the process according to one or more of Claims 1 to 28, comprising a wire guide (94) and an ultrasonic generator (34), the wire guide (94) being arranged next to a vibrating punch (92) coupled to the ultrasonic generator (34) for the purpose of subjecting the wire conductor (20) to the action of mechanical vibrations induced by ultrasound and acting in the longitudinal direction of the vibrating punch.

35. Device according to Claim 34, characterised by a pivotal axis (100) coaxial with a vibrating-punch axis (97).

36. Device according to one or more of Claims 29 to 35, characterised in that
the wire guide (23) comprises a wire-guidance capillary (37) which at least in the region of a wire-guide nozzle (30) extends in the wire guide (23) parallel to the longitudinal axis.

37. Device according to Claim 36, characterised in that
the wire guide (23) comprises, spaced from the wire-guide nozzle (30), at least one wire-supply channel (38, 39) extending obliquely in relation to the longitudinal axis of the wire guide.

38. Device according to one or more of Claims 29 to 37, characterised in that
the ultrasonic generator (34) is arranged coaxially with respect to the wire guide (23).

39. Device for implementing the process for the manufacture of a card module according to one or more of Claims 10 to 28 by making use of a device according to one or more of Claims 14 to 19, comprising

a yield supply station (65) for supplying a plurality of substrates (55) arranged in a yield (70),

a wiring station (66) with a plurality of wiring devices (22) arranged in a row transverse to the production direction,

an assembly station (67) with at least one assembly device (76) for equipping the individual substrates (55) with a chip unit (58) and

a connection station (68) with at least one connecting device (77) for connecting the chip units to an

initial coil region (51) and to a final coil region (52) of the coils (50) which are formed on the substrates (55) by the wiring devices (22).

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